AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Currently amended): A diagnostics and control system for controlling a motorized system and diagnosing the health thereof, comprising:

a controller that conveys a control signal to a motor drive to operate the motorized system in a controlled fashion; and

a diagnostics system integrated with the controller and the motor drive to comprise a single unit that diagnoses the health of the motorized system according to a measured attribute associated with the motorized system, the diagnostics system providing a diagnostic signal to the controller, the diagnostic system includes at least one of a post processing portion that is a fuzzy rule based expert system or an associative list memory component that handles long bit strings of data, the associative list memory component based at least on an unsupervised training technique capable of learning within a single epoch..

2. (Previously presented): The diagnostics and control system of claim 1, the measured attribute comprises at least one of vibration, pressure, current, speed, and temperature.

3. (Previously presented): The diagnostics and control system of claim 1, the motorized system comprises a motor and a load, the load comprises at least one of a valve, a pump, a conveyor roller, a fan, a compressor, and a gearbox.

4. (Previously presented): The diagnostics and control system of claim 1, the diagnostics system provides a diagnostics signal according to the health of the motorized system, and the controller provides a control signal to the motorized system according to at least one of a setpoint and the diagnostics signal.

5. (Previously presented): The diagnostics and control system of claim 1, the measured attribute comprises at least one vibration signal obtained from a sensor associated with a motor in the motorized system.

6. (Previously presented): The diagnostics and control system of claim 5, the diagnostics system diagnoses the health of at least one of a motor bearing, motor shaft alignment, and motor mounting according to the measured vibration.

7. (Previously presented): The diagnostics and control system of claim 6, the diagnostics system performs frequency spectral analysis of the vibration signal.

8. (Previously presented): The diagnostics and control system of claim 7, the diagnostics system comprises at least one of a neural network and an expert system, the diagnostics system provides a diagnostics signal indicative of the health of the motorized system according to frequency spectral analysis of the measured vibration signal using the at least one of a neural network and an expert system.

9. (Previously presented): The diagnostics and control system of claim 8, the controller provides a control signal to the motorized system according to at least one of a setpoint and the diagnostics signal.

10. (Previously presented): The diagnostics and control system of claim 1, the motorized system comprises a motorized pump, the measured attribute comprises at least one vibration signal obtained from a sensor associated with the pump, and the diagnostics system diagnoses the health of the pump according to the measured vibration.

11. (Previously presented): The diagnostics and control system of claim 10, the diagnostics system performs frequency spectral analysis of the vibration signal.

12. (Previously presented): The diagnostics and control system of claim 11, the diagnostics system comprises at least one of a neural network and an expert system, and the diagnostics system provides a diagnostics signal indicative of the health of the pump according to frequency spectral analysis of the measured vibration signal using the at least one of a neural network and an expert system.

13. (Previously presented): The diagnostics and control system of claim 12, the controller provides a control signal to the motorized system according to at least one of a setpoint and the diagnostics signal.

14. (Previously presented): The diagnostics and control system of claim 12, the diagnostics system employs data fusion techniques in order to derive the at least one vibration signal from at least one sensor associated with the motorized system.

15. (Previously presented): The diagnostics and control system of claim 1, the motorized system comprises a motorized pump, the measured attribute comprises a current associated with a motor in the motorized system, and the diagnostics system provides a diagnostics signal indicative of pump cavitation according to the measured current.

16. (Previously presented): The diagnostics and control system of claim 15, the diagnostics system comprises a neural network that synthesizes a change in condition signal from the measured current.

17. (Previously presented): The diagnostics and control system of claim 16, wherein the diagnostics system comprises:

a preprocessing portion operatively coupled to the neural network, the preprocessing portion conditions the measured current prior to inputting the current into the neural network; and

the post processing portion operatively coupled to the neural network, the post processing portion determines whether the change in condition signal is due to a fault condition related to the motorized system.

18. (Cancelled).

19. (Previously presented): The diagnostics and control system of claim 17, the diagnostics system detects at least one fault relating to the operation of the pump and at least one fault relating to the operation of the motor driving the pump according to the measured current.

20. (Previously presented): The diagnostics and control system of claim 1, the diagnostics system obtains a space vector angular fluctuation from a current signal relating to operation of the motor, and analyzes the space vector angular fluctuation in order to detect at least one fault in the motorized system.

21. (Previously presented): The diagnostics and control system of claim 20, the diagnostics system obtains a current signal associated with the motor, calculates a space vector from the current signal, determines a space vector angular fluctuation from the space vector, and analyzes the space vector angular fluctuation in order to detect the at least one fault associated with the motor.

22. (Previously presented): The diagnostics and control system of claim 21, the diagnostics system samples first, second, and third phase current signals associated with the motorized system in order to obtain the current signal, calculates first, second, and third phase space vectors according to the first, second, and third phase current signals, respectively, and calculates the space vector by summing the first, second, and third phase space vectors, in order to calculate the space vector from the current signal.

23. (Previously presented): The diagnostics and control system of claim 22, the diagnostics system performs a comparison of the space vector with a reference space vector, wherein the reference space vector is a function of a constant frequency and amplitude, and computes angular fluctuations in the space vector according to the comparison, in order to determine the space vector angular fluctuation.

24. (Previously presented): The diagnostics and control system of claim 23, the diagnostics system computes a polynomial expansion of an arctangent function in order to compute angular fluctuations in the space vector.

25. (Previously presented): The diagnostics and control system of claim 24, the diagnostics system performs frequency spectrum analysis of the space vector angular fluctuation in order to analyze the space vector angular fluctuation in order to detect at least one fault associated with the motorized system.

26. (Previously presented): The diagnostics and control system of claim 25, the diagnostics system computes a frequency spectrum of the space vector angular fluctuation, and analyzes the amplitude of a first spectral component of the frequency spectrum at a first frequency in order to perform frequency spectrum analysis of the space vector angular fluctuation.

27. (Previously presented): The diagnostics and control system of claim 26, the diagnostics system analyzes fluctuations in amplitude of the first spectral component in order to detect at least one fault associated with the motorized system.

28. (Previously presented): The diagnostics and control system of claim 27, the first frequency is approximately twice the frequency of power applied to a motor in the motorized system.

29. (Previously presented): The diagnostics and control system of claim 28, the diagnostics system utilizes a Goertzel algorithm to extract the amplitude of the first spectral component in order to analyze the amplitude of the first spectral component.

30. (Previously presented): The diagnostics and control system of claim 29, the at least one fault comprises at least one of a stator fault, a rotor fault, and an imbalance in the power applied to the motor in the motorized system.

31. (Previously presented): The diagnostics and control system of claim 1, the diagnostics system comprises at least one of a neural network, an expert system, and a data fusion component.

32. (Currently amended): A method of controlling a motorized system and diagnosing the health thereof, comprising:

employing a motor drive to operate a motor in the motorized system in a controlled fashion;

utilizing a component integrated with a controller to diagnose the health of the motorized system according to a measured attribute associated with the motorized system, the motor drive, the controller and the component integrated with the controller form a single entity, the component integrated with the controller includes a section that includes at least one of a fuzzy rule based expert system or an associative list memory neural network component capable of handling long bit strings of data, the fuzzy rule based expert system in bidirectional communication with the associated list memory neural network component; and

generating a diagnostics signal communicated to the controller.

33. (Original): The method of claim 32, further comprising providing a diagnostics signal indicative of the health of the motorized system, wherein operating the motor comprises controlling the motor according to at least one of a setpoint and the diagnostics signal.

34. (Original): The method of claim 33, further comprising measuring an attribute associated with the motorized system, wherein providing the diagnostics signal comprises obtaining a frequency spectrum of the measured attribute and analyzing the frequency spectrum in order to detect at least one fault in the motorized system.

35. (Previously presented): The method of claim 34, providing the diagnostics signal comprises computing a space vector angular fluctuation, obtaining a frequency spectrum of the space vector angular fluctuation, and analyzing the amplitude of a first spectral component of the frequency spectrum at a first frequency.

36. (Previously presented): The method of claim 32, diagnosing the health of the motorized system according to a measured attribute associated with the motorized system comprises:

providing the measured attribute to at least one of a neural network, an expert system, and a data fusion component; and

providing a diagnostics signal indicative of the health of the motorized system from the at least one of a neural network, an expert system, and a data fusion component.

37. (Previously presented): The method of claim 36, operating the motor comprises controlling the motor according to at least one of a setpoint and the diagnostics signal.

38-40. (Cancelled)

41. (Currently amended): An integrated control and diagnostics system for a motor, the system comprising:

a diagnostics module to generate a health assessment signal indicative of the health of the motor, the diagnostics module includes a post processing section that includes a fuzzy rule based expert system and a component that handles long bit strings in an associative list memory, the component employs an unsupervised training technique capable of learning in a single epoch, the fuzzy rule based expert system and the component in bidirectional communication; and

a controller integrated with the diagnostics module and coupled to a motor drive, the controller outputting a driving output based on the health assessment signal, the driving output is applied to the motor drive, the motor drive and the controller integrated with the diagnostics module form an indivisible unit.

42. (Previously presented): The control and diagnostics system according to claim 41, the diagnostics module generates the health assessment signal at least partially based on the driving output produced by the controller.

43. (Previously presented): The control and diagnostics system according to claim 41, the controller is associated with at least one controllable parameter, the parameter being controllable in response to the health assessment signal.

44. (Cancelled).

45. (Previously presented): The control and diagnostics system according to claim 41, further including at least one sensor, the sensor generating a signal indicative of a parameter associated with the motor, the health assessment signal is based on the sensor signal.

46. (Previously presented): The control and diagnostics system according to claim 45, the controller includes a velocity feedback loop and a torque feedback loop.

47. (Previously presented): The control and diagnostics system according to claim 46, the velocity feedback loop generates a current reference signal in response to the sensor signal, and the torque feedback loop generates the driving output in response to the current reference signal.

48. (Previously presented): The control and diagnostics system according to claim 47, the velocity feedback loop includes a P-I controller to generate the current reference signal.

49. (Previously presented): The control and diagnostics system according to claim 45, the motor parameter is one of a group consisting of velocity and vibration.

50-52. (Cancelled).

53. (Previously presented): The control and diagnostics system according to claim 41, the diagnostics module includes an ASIC that generates the health assessment signal based on a process constraint.

54. (Previously presented): The control and diagnostics system according to claim 42, the health assessment signal is indicative of whether the motor is deviating from a normal operating characteristic.

55. (Previously presented): The control and diagnostics systems according to claim 41, further comprising a coordination module coupled to a plurality of the control and diagnostics systems, the coordination module alters the driving output associated with one of the control and diagnostics systems based on the driving output of another one of the control and diagnostics systems.

56. (Cancelled).

57. (Currently amended) An integrated control and diagnostics system, comprising:

means for controlling a motorized system utilizing a health assessment signal indicative of the health of the motorized system;

means for driving a motorized system based at least in part on input from the means for controlling; and

means for generating the health assessment signal, the means for generating integrated with the means for controlling and the means for driving to constitute a single unit, the means for generating further includes a means for post processing based on fuzzy rule based logic, the means for post processing utilizes a means for persisting an associative list that handles long bit strings of data, the means for persisting capable of unsupervised training the means for generating the health assessment signal in at least one of a fast learning mode or a slow learning mode..

58. (Currently amended) A composite control and diagnostics system to control a motor, comprising:

means for effectuating movement of the motor;

means for controlling the means for effectuating movement in a controlled fashion based in part on a health assessment signal; and

means for formulating the health assessment signal, the means for effectuating movement, the means for controlling and the means for formulating the health assessment signal forming a single integrated unit, the means for formulating includes means for utilizing fuzzy rule based logic obtained from an expert and means for employing a one-shot unsupervised adaptive resonance theory-2 (ART-2) architecture comprising at least six layers.

59. (Currently amended) An integrated control and diagnostics system, comprising:

means for diagnosing the health of a motorized system amalgamated to from a unitary whole with a means for controlling the motorized system and a means for driving the motorized system based in part on a control signal from the means for controlling, the means for diagnosing producing a diagnostic signal based at least in part on application of a fuzzy rule set acquired from an expert or means for employing an unsupervised adaptive resonance theory (ART) construct comprising at least six layers, the unsupervised adaptive resonance theory construct trains the means for employing in at least one of a fast learning mode or a slow learning mode, the fast learning mode effectuates training of the means for employing within a single cycle; and

means for communicating the diagnostic signal to the means for controlling.